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Study of the biogenic soil NO_x emissions from the Australian desert.

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Nitrogen oxides (NO_x) originate from various anthropogenic and natural sources. NO_x is a trace gas with broad climate and environmental implications including: acid rain, urban smog, decreasing visibility, soil and stream acidification from leaching and eutrophication. Globally, anthropogenic NO_x emissions are well characterised, however, biogenic soil emissions are poorly accounted for. This is partly due the difficulty in performing ground based campaign in remote regions. This study is a first attempt to quantify the soil NO_x emissions from the Australian Desert using the synergy between satellite observations from GOME and simulations with global chemistry and transport model GEOS-Chem.

Soil NO_x emissions from the Australian desert, an area covering 2.5 million km^2, are investigated for the year 2000. Inverse modeled NO_x emissions were obtained by combining the *a priori* NO_x emissions from GEOS-Chem with GOME and GEOS-Chem tropospheric NO_2 columns, to produce *a posteriori* emission inventory. The total *a posterior* soil emissions for Australia in 2000 are 0.70 TgN, which accounts for 8% of the global soil NO_x emissions. The *a posteriori* soil emissions from Australia are a factor of 1.7 higher than the *a priori*. *A posteriori* soil emissions from the desert in 2000 are 0.31 TgN, which accounts for about 4% of the global soil NO_x emissions.

Soil emissions from the desert peak during spring (October, November and December) with *a posteriori* emission of 0.11 TgN, accounting for 1.3% of global soil emissions. The soil NO_x emissions from the Australian desert are of the same order of magnitude as the Australian anthropogenic emissions and have the potential to influence air quality in the spring/summer.